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Abstract

EFFECTS OF PLANT UTILIZATION ON THE ECONOMY OF HEAT-PRODUCING NUCLEAR PLANTS AND SUITABLE MEANS TO IMPROVE IT

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Present status of the economy of heat-producing nuclear plants in function of plant utilization. Comparative economic analysis of heat supply in back-pressure cycle and pure electricity generation in condensing cycle with the same small power reactor as heat source. Such an investigation is made necessary by the fact that many countries will - as the first step of their nuclear power programme - construct a small capacity reactor anyhow. As will be shown the heat-producing nuclear power plant is preferable in this case if plant utilization is high.

Evaluation of the various means to improve plant utilization:

Application of pass-out condensing turbines in heat-producing power stations. Calculation of limit values of plant utilization below which the pass-out condensing system is preferable to the pure back-pressure system. Demonstration of the increased potentialities of the pass-out condensing cycle in a nuclear plant as against conventional plant.

Combination of heat-producing nuclear power plant and fossil fuel fired peaking boiler plant. As will be shown, the application of a peaking boiler plant improves the economy of nuclear heat supply even while nuclear energy is not competitive with fossil fuels. Calculation of the optimal values of peaking boiler plant capacity in function of plant utilization. Effects of reactor capital cost reductions on optimum peaking plant capacity. Comparative analysis of conventional and nuclear heat-producing power plant showing that with the latter the application of a peaking boiler plant results in increased savings and the optimal value of peaking plant capacity is also increased.

Application of heat accumulators to meet the daily fluctuation of the heat demand. Description of the various systems of heat storage. Parametric calculation of the cost of heat sent out from nuclear versus conventional power plant using heat accumulators pointing to the increased importance of heat storage in nuclear plants.

Centralized heat supply to several heat consumers. Demonstration of the possibilities to improve plant utilization by supplying heat to several heat consumers from a central reactor plant. Possible effects of nuclear energy application on the siting of new heat consumers.

Other possibilities of improving the load factor of nuclear power plants, such as combination plants for space heating and air conditioning and the application of heat pump.